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Author(s):	Zainun Mustafa[1], Azizan Baharuddin[2], Shaikh Mohd Saifuddeen[2]
Affiliations:	[1]National Child Development Research Centre University Pendidikan Sultan Idris, Malayisa [2]Institute of Islamic Understanding Malaysia
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Indexing

Islam, Science and Education: Delving into the Progress, Collaboration and Biases

Zainun Mustafa*
National Child Development Research Centre,
University Pendidikan Sultan Idris, Malayisa

Azizan Baharuddin
Shaikh Mohd Saifuddeen
Institute of Islamic Understanding Malaysia

Abstract

Despite the fact that Islam being one of/counts among the major religions of the world, scientific progress in Muslim majority countries seems to be lagging behind the rest of the world. Therefore, there have been calls by Muslim scholars and clerics to bridge the gap between Islam and science, especially for young Muslims, by harmonising science and Islam in education. This study aims to analyze the documents pertaining to Islam, Science, and Education (ISE) extracted from the historical literature. For the purpose of analysis, firstly documents were retrieved from a scientific database and secondly, a descriptive analysis of temporal trends was conducted. The documents clustered according to as the time-lined categories were and then analysed qualitatively. Later, using VOS viewer, the analysis of spatial distribution, networks, and keywords was conducted. It was found that the evolution of ISE converged into a broader spectrum from earlier in medicine and later to other areas, which encompassed Qur'ānic studies, social studies and economics, and even technology. The volume of publication versus the network links strength provided evidence that there is a need to stimulate collaborative works by/through knowledge dissemination through/from an authoritative platform for the researches concerning ISE. This study also discovered that some severe biases that might contribute towards the results being skewed in the finding or even underrepresentation of scholarly works in ISE. The findings of this study are beneficial for the researchers reviewing this topic and the educators working to harmonize Islam and science in education.

Keywords: Islam, science, education, trends, bibliometric, Islamic science education, review

Introduction

'Islam, Science, and Education' (ISE) is a mutually exhaustive topic. The debate, whether Islam and science are in conflict or in harmony, is an issue that has long been debated. Contemporary views that separate the faith system from scientific activities has

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*Corresponsdence concerning this article should be addressed to Dr. Zainun Mustafa, Post Doctoral Researcher, National Child Development Research Centre, Universiti Pendidikan Sultan Idris, Malayisa, at zainunmustafa@gmail.com

brought about serious issues, such as the acceptance of science and technology among the Muslim majority countries. This has resulted in the Muslim majority countries to be lagging in scientific and technological development.[1]

However, in the past few decades, in an effort to elevate the Muslim majority countries' status in science and technology, the topic of ISE has been widely discussed either exclusively or integratively with other disciplines. By understanding the underlying issues in the respective local context (i.e., culture, colonial influence, governance), the Muslim scholars have attempted to form a more systematic and harmonious philosophy to encourage scientific exploration within the the Muslim faith system. Rather than adopting secularism and rejecting the role of religion, the call is to develop the sense that scientific progression was stimulated by the pious Muslim scientists that resulted in the Islamic world standing at the vanguard of scientific endeavours during the medieval period.[2] Thus, the Muslim scholars including the Muslim clerics, proposed an innovative paradigm of philosophical thought to support the co-existence of scientific advancement as a way of life for the Muslims. This innovative philosophy is indicated by several terms such as Muslim science,[3] Islamic science,[4] scientific thought in Islam,[5] tawhidic science,[6] and

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[1]Declan Butler, "Academies Wrestle with Issue of Islam's Flagging Science Base," *Nature*, 422. 6928 (2003): 101-101. https://doi.org/10.1038/422101a.

[2]Eric Chaney, "Tolerance, Religion and the Rise and Fall of Islamic Science," *Working Paper, Dept Econ, Harvard Univ., Cambridge, MA*, (May, 2016): 1-32.

[3]Joseph Abraham Levi, "Muslim Science as the Source of the Portuguese Age of Discoveries," *Comparative Literature and Culture*, 14.5 (2012). https://doi.org/10.7771/1481-4374.2135.

[4]Seyyed Hossein Nasr and De Santillana Giorgio, *Science and Civilization in Islam* (Harvard University Press, 1968); Tedi Priatna, "Islamic Science: Theological Doctrine of Science Learning in Islamic Universities," *International Journal of Psychosocial Rehabilitation*, 24.7 (2020): 973-80.

[5]Sh. Mohd Salleh Sh Mohd Saifuddeen, and Baharuddin Azizan, "Significance of Science and Scientific Thought from the Islamic Perspective," *International Journal of Quranic Research,* 1 (1), (2011): 73-87.

[6]Osman Bakar, "Ilmu Tauhid Berasaskan Kajian Saintifik," [Tawhid Knowledge based on Scientific Studies] in *Ilmu Dan Kecemerlangan Dari Perspektif Islam*,[Knoweldge and Excellence from an Islamic Perspective], ed., Ismail Ibrahim and Abdul Rahman Mohd Sahri (Kuala Lumpur: IKIM, 1994); Mohd Yusof Othman, "Kesepadukan Ilmu Pengetahuan Sains Dalam Sistem Ilmu Wahyu [Connection of Science Knowledge in the Revelation Knowledge System]," 3.1 (2020): 1-13.

Islamization of contemporary knowledge.[7] As argued by Ghalia and Hossen,[8] several authors have referred to the same concept using various phrases. For instance, de-secularisation (viz. Hurd[9]), de-colononisation and deWesternisation,[10] or integration of knowledge holistically.[11]. These are several alternative terms referring to the need to restructure the mode of knowledge acquisition in the contemporary Muslim societies. The differences might lie in the different schools of thought vis-à-vis Islam and science. However, they share the same essence: forming a bridge between contemporary knowledge (or science) and Islam.

These philosophical thoughts, ideas, and interactions have been put forward to educate the young generation of the Muslims. Many institutions have been established at the national and international levels as platforms to deliberate on ISE. Subsequently, these efforts advocate science advancement within the purview of Islam manifesting itself in a number of politico-socio-religious movements. The advocacy is catalysed by several religio-scientific research institutions (e.g. The Institute of Islamic Understanding Malaysia), academies (e.g. the International Islamic Fiqh Academy), organisations (e.g. the Islamic Organization of Medical Sciences) and the universities (e.g. the International Islamic University Malaysia and Universiti Sains Islam Malaysia, with the latter having established the Islamic Science Institute under its auspices). Advocacies are done to disseminate and promote the importance of scientific knowledge to be accepted in the Muslim community without becoming a threat to the Muslim faith system. The discourse is published from reputable literature platforms for critical evaluation and endorsement in academia across the globe. This article aims to assess how far this effort has been made by examining trends in past literature and collaborative works pertaining to ISE. Therefore, this study provides insight into the progression in ISE and the networks that may exist.

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[7] Muhammad Naquib Al-Attas, *Islām and the Philosophy of Science* (Kuala Lumpur: International Institute of Islamic Thought and Civilization, International Islamic University Malaysia, 1989); Ismail Raji Al-Faruqi, *Islamization of Knowledge: Problems, Principles, and Prospective* (Kuala Lumpur: International Institute of Islamic Thought and Civilization, International Islamic University Malaysia, 1988); Mohd Kamal Hassan, "Islamization of Human Knowledge," *Islamic Economics Education in Southeast Asian Universities* (2014): 13-50.

[8] Bouhedda Ghalia, and Belayet Hossen, "Integration of Knowledge: A Time Befitting Step," *'Abqari Journal* 19 (2019): 1-21. https://doi.org/10.33102/abqari.vol19.1.

[9] Elizabeth Shakman Hurd, "Narratives of De-Secularization in International Relations," *Intellectual History Review* 27.1 (2017): 97-113 . https://doi.org/10.1080/17496977.2016.1255462.

[10] Nabila Huringiin, and Halimah Nisrina Azfathir, "The Concept of Syed Muhammad Naquib Al-Attas on De-Westernization and Its Relevancy toward Islamization of Knowledge," *Kalimah*, 16.2 (2018) . https://doi.org/10.21111/klm.v16i2.2867; Wan Mohd Nor Wan Daud, *Islamization of Contemporary Knowledge and the Role of the University in the Context of De-Westernization and Decolonization* (Penerbit Universiti Teknologi Malaysia, 2013).

[11] Tajul Arifin, *Pendidikan Dan Pembangunan Manusia: Pendekatan Bersepadu* [Education and Human Development: An Integrated Approaches] (Selangor: Syabab Media, 2002).

2. Background

Islam is a religion that is pro-science, with the holy Qur'ān stating the duty of the Muslims to seek knowledge of the natural world. On that ground, the contributions of the Islamic civilisation in science and technology during the medieval period need to be acknowledged. History has also shown that colonialism and post-colonialism have indoctrinated Western ideologies including secularism, materialism, atheism, positivism, modernism, and postmodernism [12] into policies and the education system in Muslim majority countries. This phenomenon has led to the view that science and technology is a Western doctrine and is 'in conflict' with the Islamic Worldview, leading to a condition where the Muslims' commitment to pursue the study in science is affected.[13] The Western doctrines are seen to be advocating unbelief in God, and the Hereafter. This turns to contradict the principle of *Tawhīd*. It is argued that a better and innovative approach in science education might encourage the Muslims to master and excel in science and technology without alienating the essence of *Tawhid* in their life.

2.1. Islam and Science

The concept of science is important in Islam. From the historical point of view, the Arabs sought to explain the natural world around them.[14] During the eighth century, the Muslim scientists revised and re-introduced Greek scientific treatises in the various fields of knowledge including astronomy, medicine, engineering, botany, chemistry, and mathematics to the Arabic-speaking world.[15] From the ninth century onwards, the Islamic world's cultural and intellectual unity started to take their distinctive form when scholars travelled from one end of the empire to the other.[16] With the support of the Caliph, scholars thronged centres of knowledge in the Islamic world to write, translate and study manuscripts, books, and ideas creating exponential growth in the development of science. Conventional narratives agreed that the rise of scientific advancement took place in the Islamic civilisation although there are disagreements on how it eventually declined.[17] One reason identified for the decline of the Islamic civilisation is political elitism among the

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[12] Tedi Priatna, "Islamic Science: Theological Doctrine of Science Learning in Islamic Universities."; Ghalia and Hossen, "Integration of Knowledge: A Time Befitting Step," 1-21.

[13] Rana Dajani, "Why I Teach Evolution to Muslim Students," *Nature*, 520. 7548 (2015): 409-409. https://doi.org/10.1038/520409a.

[14] Nurcholish Madjid, *Islam: Doktrin and Peradaban* [Islam, Doctrine and Civilization] (Gramedia Pustaka Utama, 2019).

[15] Nidhal Guessoum, "The Qur'an, Science, and the (Related) Contemporary Muslim Discourse," *Zygon*, 43.2 (2008): 411-31 . https://doi.org/10.1111/j.1467-9744.2008.00925.

[16] Stelios Michalopoulos, Alireza Naghavi, and Giovanni Prarolo, "Trade and Geography in the Spread of Islam," *The Economic Journal*, 128. 616 (2018): 3210-41. https://doi.org/10.1111/ecoj.12557.

[17] Ayman Shabana, "Science and Scientific Production in the Middle East," *Sociology of Islam*, 8.2 (2020): 151-58. https://doi.org/10.1163/22131418-00802001.

Muslim rulers. [18] It is argued that while the ruler and religious leaders elevated and encouraged the development of scientific knowledge during that era, elitism and political instability impacted the scientific enterprise. [19] Since then, Islam and science are perceived to be in a state of dichotomy, which became worsened with the advent of colonialism and postwar socio-political instability.

While historical accounts of the contributions of the Muslim scientists and scholars during the peak of Islamic civilization is well documented, there is a lack of clarity regarding the conceptual and taxonomical understanding of Islam and science. What does "Islamic science" refer to? It is clear that "science" refers to knowledge, with etymological origins from Latin's "*scientia*" and "*scire*" which means "know." [20] The adjective, "Islamic," implies an attribute of the monotheistic faith revealed through Muhammad (*SAW*) as the Prophet of Allah. The Muslims are defined as a group of people with a similar faith system. Does "Islamic science" refer to science done by individuals who profess Islam? Or, does it refer to a particular "Islamic" take on science? Or taking the definition of science as knowledge, does it refer to the scientific study about Islamic scripture on faith system? This lack of clarity serves as a caveat in understanding the typology of the interaction between Islam/Muslim faith system with science. [21]

The vague understanding of Islam and science is not just framed in the transliteration of different language systems (i.e., Latin, Arabic, Engish), but the historical perspectives also play a crucial role. In pre-modern scientific developments in the Middle East, the acknowledgement is given to the Abbasid caliphate who encourages the development of science in the Islamic world [22] with the foundation of Baghdad as the seat of power in 762 CE. This development resulted in a translation movement by the end of the tenth century. [23] Most of the scientific and philosophical secular Greek works available in the Late Antiquity were translated into Arabic. [24] These works were translated at the renowned *Bayt al-Hikmah*

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[18]Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early ʿAbbāsid Society (2nd-4th/8th-10th Centuries)* (Psychology Press, 1998).

[19]Chaney, "Tolerance, Religion and the Rise and Fall of Islamic Science," 1-21.

[20] Saja Parvizian, "Scientia, Diachronic Certainty, and Virtue," *Synthese* (2020): 1-47. https://doi.org/10.1007/s11229-020-02626-y.

[21]Sh. Mohd Salleh Sh Mohd Saifuddeen, "Tipologi Interaksi Antara Agama Dan Sains: Satu Penilaian Dan Cadangan Menurut Perspektif Islami," [Typology of Interaction between Religion and Science: Assessment and Suggestion according to Islamic Perspective] (Universiti Malaya, 2012).

[22]Ayman Shabana, "Science and Scientific Production in the Middle East."

[23]George Saliba, "Avicenna's Shifāʾ (Sufficientia): In Defense of Medieval Latin Translators," *Der Islam*, 94.2 (2017): 423-33.; George Saliba, *A History of Arabic Astronomy: Planetary Theories During the Golden Age of Islam* (NYU Press, 1995).

[24]Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad.*

(House of Wisdom), and included diverse disciplines of knowledge such as astrology, chemistry, physics, mathematics, medicine, and the various branches of philosophy.[25] As science itself is progressive and dynamic across time and geographical boundaries, the Muslims obtained scholarly texts from the Greeks, especially those of Aristotle, Ptolemy, and Euclid,[26] Indian and Persian. These texts were then translated, commented and revised at the *Bayt al-Hikmah*. Being that in mind, the *Bayt al-Hikmah* functioned as a research institution for translation and library. George Sarton noted that the Muslims adopted and adapted Greek theories and reconciled them with monotheistic sensibilities of the *tawhidic* paradigm or elevated the contents with new advances made in science. If these activities are taken to be as Islamic science, then it refers to a particular period of scientific exploration done in the Middle East during the governance of the Muslim caliphate.

There are many Muslim scientists around the world engaged in scientific endeavours. They are scientists and, at the same time, Muslims.[27] Islamic science could then possibly be referred to as the scientific discovery made by these Muslims. Most of the Muslim scholars have highlighted major features of science within the ambit of Islam to avoid the secular scientific thinking of the West. With this perspective, the Muslim scholars have attempted to build a harmonious bridge linking Islam and science through education. Education is seen as a platform to assimilate science within the contemporary Muslim community.

2.2. Progress in Education

Efforts in advocating scientific development under the Islamic paradigm is a progressive undertaking by various parties. For instance, Madani[28] stated that the idea to reform Islam and science are perceived among Muslims led to the establishment of the Association of Muslim Social Scientists in the United States of America in 1972. Subsequently, the International Institute of Islamic Thought (IIIT) was co-founded in 1981 by Isma'il Rajhi al-Faruqi. At the national level, Islamic universities which offer academic programmes in the form of integrated knowledge has taken the initiative to develop new

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[25]Adel M. Abdulaziz Algeriani, and Mawloud Mohadi, "The Administrative and Technical Aspects in Baghdad and Cairo's House of Wisdom Libraries (a Comparative Analysis)," *Arts and Social Sciences Journal*, 09.05 (2018). https://doi.org/10.4172/2151-6200.1000402.

[26]Ali Abdullah Al-Daffa,' *Arithmetic," The Muslim Contribution to Mathematics* (Routledge, 2020); Omar El Ghazi and Bnini Chakib, "Arabic Translation from Bait Al-Hikma to Toledo School of Translators: Key Players, Theorization and Major Strategies," *International Journal of Linguistics, Literature and Translation (IJLLT)*, 3.11 (2020): 55-67 . https://doi.org/10.32996/ijllt.

[27]Anis Nurashikin Nordin, "Regenerating Muslim Inventors – The Present Future," *'Ulum Islamiyyah: The Malaysian Journal of Islamic Sciences* 31 (2020).

[28]Rehaf A. Madani, "Islamization of Science," *International Journal of Islamic Thought*, 9.1 (2016): 51-63 . https://doi.org/10.24035/ijit.09.2016.006.

generations of the Muslims who are imbued with religious values while at the same time are able to collaborate in a transparent manner with global communities.[29]

Specifically, in education, this particular progress was catalyzed by the Eighth World Conference on the Muslim Education.[30] The pioneer conference was the First World Conference on the Muslim Education held in 1977, with a total of 307 delegates and 150 papers from countries with a Muslim population. According to Iqbal,[31] the aims of the conference were: 1) to help the non-Muslim world to know Islam, 2) to help the Muslims to rediscover and reinforce the dynamics of Islam, and 3) to redefine the Islamic concept of education. The first conference was then continued with the Second World Conference on the Muslim Education, sponsored by the King 'Abd al-'Aziz University in Jeddah and the Quaid-i Azam University in Islamabad. According to Mabud, the idea of Islamisation of knowledge was strategically initiated by Isma'il Raji Al-Faruqi. Taha Jabir al-Alwani then revised this idea in order to be methodologically sound to be adapted for education. After the second conference, discussions on the relationship between Islam and science started to have varying perspectives. Discussions include critiques by scholars regarding the degree of interaction between Islam and science. Compared to the first conference, the second conference focused primarily on the policy reformation and curriculum design.

As noted by Mabud, the Third World Conference on the Muslim Education was held in 1981 in Dhaka, Bangladesh jointly organised by the Institute of Islamic Education and Research at the Islamic University Bangladesh, and King Abdulaziz University, Saudi Arabia. The third conference focused on the spectrum of education (specifically the development of textbooks). Meanwhile, the Fourth World Conference on the Muslim Education was held in Jakarta, Indonesia in 1982. This time, the conference concentrated on teaching methodologies and teacher education courses. The third and fourth world conferences were organised in cooperation with the World Centre for Islamic Education (WCIE). According to Ashraf,[32] to review the progress made on the basis of the previous World Conferences. The Fifth World Conference on the Muslim Education in 1987 was hosted by the Muslim Youth Organization in Egypt, and discussed ways of implementing the recommendations systematically. Subsequently, the Sixth World Conference on the Muslim Education in 1996 was organized by the Association of the Muslim Schools of South Africa. This conference was a workshop with participants divided into groups to

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[29] Tedi Priatna, "Islamic Science: Theological Doctrine of Science Learning in Islamic Universities."

[30] Shaikh Abdul Mabud, "World Conferences on Muslim Education: Shaping the Agenda of Muslim Education in the Future," *Philosophies of Islamic Education: Historical Perspectives and Emerging Discourses* (2016): 129-44 . https://doi.org/10.4324/9781315765501.

[31] Muhammad Iqbal, "First World Conference on Muslim Education and Its Possible Implications for British Muslims," *Learning for Living*, 17.3 (1978): 123-25. https://doi.org/10.1080/00239707808556988.

[32] Syed Ali Ashraf, "Islamic Education and Evaluation of Past Conferences and Post-Conference Achievements 1977-1989," in *The Education Conference Papers,* (1991): 35-37.

prepare model lesson plans and teaching guidelines before deliberating upon them in plenary sessions. The Seventh World Conference on the Muslim Education in 2009 in Kuala Lumpur, Malaysia organised by *Ikatan Ilmuan Malaysia* and the International Islamic University College Selangor. In 2012, the Eighth World Conference on the Muslim Education was held in Bandar Seri Begawan, Brunei Darussalam. The objectives of these conferences were to discuss a wide range of educational issues in the context of globalisation and to establish networking among researchers from various parts of the world.

The eight major conferences are further reconciled at the national level by establishing government-run institutions such as fatwa bodies, muftis, and research institutions, including *falaq* observatories, *awqaf* department, and halal institutions. These bodies address the vocational issues concerning the Muslim values and ethics. Formal education is carried out primarily by academics at the universities with the support of various associations, institutions and organisations. Efforts undertaken at these formal institutions provide the depth of impressive literature that could be retrieved to clarify issues related to the modern scientific development as deliberated from various Islamic perspectives.

3. Methodology

3.1. Source of Information

The SciVerse Scopus database was selected to serve the purpose of the study. Scopus is a comprehensive database of bibliographic information created by Elsevier in November 2004. From the comparative studies regarding the available biblio-databases, Scopus is regarded as the most comprehensive and thus, able to facilitate bibliometric analysis. The bibliographical information is extracted from the Scopus database onlu to avoid multiple and redundant documents that are sometimes indexed in more than one database. This study attempted to compose as much information from the historical timeline with no exclusion criterion included. Even though there is a concern regarding false-positive results, the retrieved article would somehow be regarded as inclusive in the topic by the algorithm itself. Concerning this aspect, this study attempted to uncover the false-positive result manually, if any.

3.2. Data Extraction

The key terms consisting of Science, Islam, and Education were keyed in and followed by the appropriate Boolean operators. Overall, 416 documents hit were returned. The information was extracted into excel spreadsheets for further analysis on 19 September 2020. Descriptive analysis was employed to analyse the historical trend through Microsoft Office Excel.

3.3. Analysis

According to the timeline, the frequency of documents tabulation was divided into three; 1971–1999, 2000–2010, 2010–present. A qualitative and quantitative analysis was

performed from the data by synthesising titles and abstracts through systematic literature review matrices. Full-text articles were downloaded for further clarification on particular issues. The same extracted documents were further analysed using the VOS viewer. As compared to the descriptive analysis of the temporal and geographical distribution, the VOS viewer is a software tool for visualising the network data based on constructed maps of scientific publications and keywords.[33] The VOS viewer gave the insight to understand the extracted articles' scientific landscapes by calculating the cumulative strength of co-authorship links with the represented unit of analysis. The units of analysis chosen were authors, affiliations and countries. The keywords occurrences were also studied to better enhance the popular topic in ISE.

4. Finding and Discussion

4.1. The Trend in ISE Fractioned according to the Historical Timeline

The number of published documents steadily increases with slight fluctuation throughout the historical timeline. The trends can be referred in Figure 1.
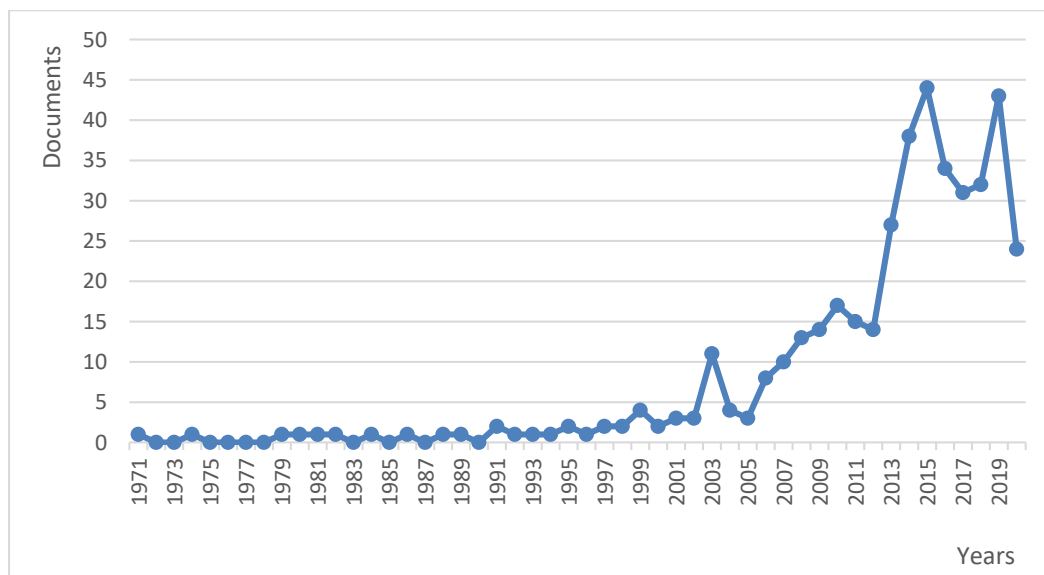

Figure 1. The evolutionary trends in the publication of ISE

For better perspectives on the evolutionary trends, the findings were divided into three; 1971–1999, 2000–2010, and 2010–present.

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[33]Nees Jan van Eck, and Ludo Waltman, "VOSviewer Manual," *Leiden: Univeristeit Leiden*, November, 2013. http://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.1.pdf.

4.1.1. Twenty Six 26 Documents from 1971-1999

The earliest documents retrieved regarding ISE were on Arabic medicine and its impact on teaching and practicing the healing arts in the West by Hamarneh.[34] From this first encounter, the terms Arab and Islam were intertwined with the historical viewpoint of the Muslims' early medical practice. The documents extracted framed between 1971 and the 1990's were highly inclined towards medicine and nursing practice (69.2%). The topics included Islamic practice in medicine in the societies such as doctors' training,[35] obstetrics and gynaecology in society,[36] and nutrition.[37]

Most of the articles in the field of medicine were focused on Ibn Sina (Latinised as Avicenna) and his magnum opus which is the medical encyclopaedia, *al-Qanūn fi al-Tibb* (*The Canon of Medicine*) that became the standard textbook on the subject and ethics. Compared to the early articles that tended towards medicine, the documents at the end of the 20th century saw that discussions on ISE started to proliferate into other areas of study. Most of the titles and discussions referred to scholars' ideas (e.g. al-Nadwi[38]) or socio-cultural reforms about a specific country.[39]

It is noteworthy that most of the earliest documents were from the United States, Egypt, Belgium, Canada, Germany, India, Saudi Arabia, Turkey, and the United Kingdom. From 26 documents, the languages used in the documents were English with 18 documents (the highest frequency), followed by German with two documents, Persian with two documents, Turkish with two documents, Portuguese with one document, and Serbian with one document. Based on the distribution of geographical and language frequency of documents, most of the early ideas of ISE were from the United States, Middle East and Europe. It is

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[34]S Hamarneh, "Arabic Medicine and Its Impact on Teaching and Practice of the Healing Arts in the West," *Accademia Nazionale Dei Lincei. Fondazione Leone Caetani* (1971): 395-425. http://www.ncbi.nlm.nih.gov/pubmed/19601382.

[35]Friedrun R Hau, "The Education of the Doctor in the Islamic Middle Ages," in *Clio Medica : Acta Academiae Internationalis Historiae Medicinae,* Vol. 13 (Brill | Rodopi, 1978): 95-123, https://doi.org/10.1163/9789004418257_016; Abdullah Basalamah, Edwin Rossinski, and Henry Schumacher, "Medical Education at King Abdulaziz University," *Health Policy and Education*, 1.1 (1980): 107-16. https://doi.org/10.1016/S0165-2281(79)80007-7.

[36]Rochelle N. Shain, "Abortion Practices and Attitudes in Cross-Cultural Perspective," *American Journal of Obstetrics and Gynecology*, 142.3 (1982): 245-51. https://doi.org/10.1016/0002-9378(82)90725-6.; Anita Y. Compton, "Multicultural Perspectives on Sex Education," *Sexual and Marital Therapy*, 4.1 (1989):75-85, https://doi.org/10.1080/02674658908407876.

[37]Mahesh C. Gupta ,et al., "Relation of Childhood Malnutrition to Parental Education and Mothers' Nutrition Related KAP," *The Indian Journal of Pediatrics*, 58.2 (1991): 269-74 . https://doi.org/10.1007/BF02751136.

[38] Salahuddin Al-Nadwi, "Mohammad Iqbal, Al-Ḥaḍarah Al-Gharbīyah Wa Qaḍayā Al-Tajdīd," *Studia Islamika*, 2.1 (2014). https://doi.org/10.15408/sdi.v2i1.845.

[39] Akhtar Hasan Khan, "Education in Pakistan: Fifty Years of Neglect," *The Pakistan Development Review*, 36.4II (1997): 647-67. https://doi.org/10.30541/v36i4IIpp.647-667.

important to note that the geopolitical dynamics and postwar Islamic movements were prominent in the mentioned area. During this particular time, many countries were concerned about establishing their national identities and attempted to eradicate any colonial image. Even though a similar conflict happens in the eastern countries, the documents are not indexed in the database. Another important signposting is the unavailable of documents in Arabic in the database. Some documents listed in the database were not able to be retrieved or had incomplete citation information. These documents were omitted even though these documents may contain meaningful perspectives on ISE.

4.1.2. Eight Eight (88) Documents from 2000-2010

From the 2000 to 2010, 88 documents were published in the database. ISE's concern started to propagate into the social sciences and humanities (40%) from medicine and nursing (20.2%). The remaining 19.8% were from other subjects, including but not limited to engineering, agriculture, computer science, biochemistry, molecular biology and genetics, management and business. Countries involved in ISE discourse started to be diverse compared to before the 2000's. The top ten published documents as arranged in descending order in terms of quantity (from more than 30 countries) are: the United States of America, the United Kingdom, Australia, Turkey, Canada, Egypt, France, Israel, Malaysia, and Saudi Arabia. The increased number of spatial distributions proved that research and higher education institutions were dedicated to research on the important agenda pertaining to social, cultural, and humanities. At this juncture, the discourse of ISE appeared to be converging. Among the topics of interest included the influence of the Arab society on science and technology,[40] evolution and religion in education,[41] philosophical discourse,[42] and psychology.[43] The documents were published in a number of languages primarily English with 78 documents, French with five documents, Arabic has three documents, while one each for German and Turkish. The active journals that have succeeded in publishing an article in the corpus of ISE during this period were the *Journal of Religion and Health*, *Asian Social Science*, *Jurnal Pendidikan IPA Indonesia*, and *Contemporary Islam*.

Amidst the geopolitical turmoil and demonisation of Islam, discourses and research interest in ISE saw an incremental change. Most notably was the unusual peak in documents published post-2001, or more specifically post-9/11 tragedy. The term

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[40]Abdullateef H. Haidar, "Professors' Views on the Influence of Arab Society on Science and Technology," *Journal of Science Education and Technology*, 9.3 (2000): 257-73 . https://doi.org/10.1023/A:1009447718203.

[41]J. R. Downie and N. J. Barron, "Evolution and Religion: Attitudes of Scottish First Year Biology and Medical Students to the Teaching of Evolutionary Biology," *Journal of Biological Education*, 34.3 (2000): 139-46 . https://doi.org/10.1080/00219266.2000.9655704.

[42]Seng Piew Loo, "Islam, Science and Science Education: Conflict or Concord?," *Studies in Science Education*, 36.1 (2001): 45-77. https://doi.org/10.1080/03057260108560167.

[43] S. Atran, "Genesis of Suicide Terrorism," *Science*, 299.5612 (2003):1534-39, https://doi.org/10.1126/science.1078854.

"terrorism" associated with Islam appeared in the bibliographic information in seven articles published between 2000 and 2010.

4.1.3. 302 Documents from 2011–2020

Another 11 articles published between 2011 and 2020 also revolve around "terrorism–Islam." Apart from that trend that seemed to be a spillover from the 9/11 incident, the publication trend during this period started to move into science, social studies and humanities (56%), as well as medicine and nursing (21%). Still, most of the published documents were from the United States of America. However, European, Middle Eastern, and Asian countries also contributed to the research concerning ISE. Indonesia, Malaysia, Iran, the United Kingdom, Turkey, Russia, Saudi Arabia, and Canada were the top ten contributing countries. The languages used in the publication include English with 278 documents, Russian with 15 documents, Turkish with six documents, Persian with two documents, and Italian with one document. During this period, the understanding of Islamic science in education published documents touched on Qur'ānic learning,[44] curriculum analysis and reforms,[45] Islamic values in education,[46] and technology and digital-based education.[47] From the retrieved documents, Islamic theology's systematic learning began to be published in reputable journals. Leading the publication in ISE are journals such as *the Asian Social Science*, *Journal of Religion and Health*, *Istoriya*, *Journal Pendidikan IPA Indonesia*, and *Nature*.

The prospective documents in the Scopus database are expected to increase from year to year. It can be argued that in the 21st century, the idea of publishing using formal academic platforms as a means to disseminate information has been widely accepted. Hence, allowing for the exchange of ideas and learning vis-à-vis ISE to take place across geographical boundaries, language barriers, and socioeconomic gaps, and this, in turn, has established an increased interaction among scholars across the academia.

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[44]Asyraf Ab Rahman, et al., "Qur'ānic Literary Study: Sayyid Qutb's Thought and Orientation," *Asian Social Science*, 11.4 (2015): 218-22. https://doi.org/10.5539/ass.v11n4p218; R. M. Saat, et al., "Memorization Activity and Use of Reinforcement in Learning:Content Analysis from Neuroscience and Islamic Perspectives," *Journal of Applied Sciences*, 11.7 (2011): 1113-20. https://doi.org/10.3923/jas.2011.1113.1120.

[45] Ozgur Taskin, "Can Willingness and Hands-on Work Together? Teaching Biological Evolution and Dealing with Barriers," *Evolution: Education and Outreach*, 4.3 (2011): 467-77, https://doi.org/10.1007/s12052-011-0341-6; Anila Asghar, Salman Hameed, and Najme Kishani Farahani, "Evolution in Biology Textbooks: A Comparative Analysis of 5 Muslim Countries," *Religion and Education*, 41.1 (2014): 1-15. https://doi.org/10.1080/15507394.2014.855081.

[46]Saeeda Shah, "Islam, Education, and Gender: Discourses and Practices Among Pakistani Diaspora in the UK," in *Gender, Religion and Education in a Chaotic Postmodern World* (Dordrecht: Springer Netherlands, 2013), 241-52. https://doi.org/10.1007/978-94-007-5270-2_16.

[47]Shaharudin Ismail, et al., "User's Awareness Survey on 1CITIZEN Program in Universiti Sains Islam Malaysia (USIM)," *Of Theoretical and Applied Information Technology*, 2015.

4.2. Networks among the Authors, Organisations, and Countries

The overall frequency analysis is presented in Table 1 to understand the research landscape and networking activities of ISE. Two types of analyses were conducted using VOS viewer, namely co-authorship analysis which looked at authors, affiliations and countries of origin; and occurrence analysis which looked at the keywords used. The minimum number of documents for analysis was also recorded.

Table 1. Minimum number of documents for bibliometric coupling analysis

Type of Analysis	Unit of Analysis	Minimum Number of Documents		
		1	2	3
Co-Authorship	Author	865	37	10
	Organisation	644	14	nil
	Country	62	42	27
Occurrence	All Keywords	2742	660	360
	Author Keywords	1255	136	55
	Index Keywords	1732	549	314

4.2.1. Authors

Table 2 shows the respective number of documents, number of citations, and total link strength of the network amongst the top ten authors according to the cumulative strong network strength. In Table 2, the number of the published documents in Scopus is unrelated to the network strength.

Table 2. Top ten authors contribution

Author	Documents	Citation	Total link strength
Ali N.	3	1	8
Ismail D.	3	1	8
Wan Ahmad W. I	3	1	8
Adam F.	3	1	6
Asghar A.	3	3	1
Hameed S.	4	32	1
Butler D.	3	93	0
Davids N.	3	29	0
Hassan A.	3	3	0
Hosseini S.H	3	25	0

The authors with the highest number of documents and citations have written on practical ideas concerning Islam or Muslim and science. For instance, concerns regarding the curriculum's controversial science topic focused on the Muslim women, religious practices, and literacy. However, most of the listed scholars were currently affiliated with institutions in the United States of America. Nevertheless, several authors with relatively high strength in networks were from Malaysia. The focus of close networking was on

particular Muslim thinkers which resulted in homogenous networking and concentrated on similar affiliations. The network strength can be noted in Figure 2.
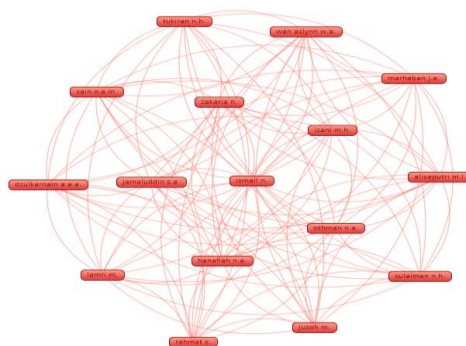

Figure 2. The network map

4.2.2. The Affiliated Organisation of the Author

Even though the highest affiliation concerning ISE were from the International Islamic University of Malaysia with 15, Tehran University of Medical Sciences with 11, Shahid Beheshti University of Medical Sciences with seven, the University of Malaya with seven, Universiti Sultan Zainal Abidin with seven, and Universiti Kebangsaan Malaysia with six, it is noted that the networking and interaction among the researchers were converging. From the VOS viewer screening, the organisations with the highest link strength were the School of Social Development of Universiti Utara Malaysia, the Faculty of Islamic Contemporary Studies of Universiti Sultan Zainal, and the Centre for Fundamental and Liberal Education of Universiti Malaysia Terengganu. The finding showed that research-based interaction among scholars towards publication in the Scopus database was active among these Malaysian university academics. However, the distribution is homogenous with the need for more international collaboration and networking.
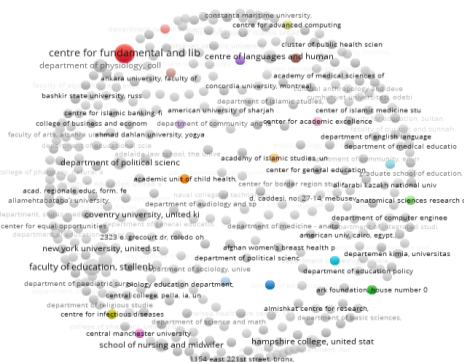

Figure 3. Homogenous networking among the affiliated institution

4.2.3. Geographical Distribution

From the geographical distribution, the cumulative strength of co-authorship of countries is presented in Table 3 and Figure 4.

Table 3. The top ten contributing country in ISE

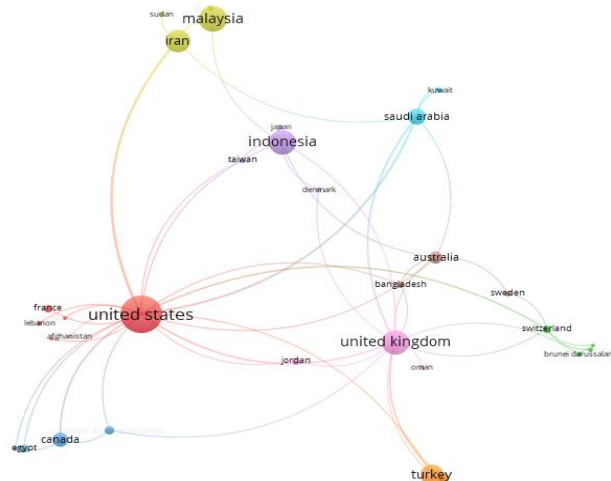| Country	Citation	Total Link Strength
United States	1183	15
United Kingdom	597	9
Saudi Arabia	206	8
Iran	190	7
Australia	129	4
Indonesia	88	4
Turkey	87	3
Canada	191	2
Malaysia	243	2
Pakistan	8	2
Germany	25	0
Russia	47	0

Figure 4. The links among the country

From the acquired data, the volume of publications and the networks were not always in line with one another. For instance, Malaysia has more publications, but Iran, Australia, and Indonesia outnumbered Malaysia in link strength scores. Thus, it showed a need for the interactive norm and non-solitary research work in Malaysia, Canada, and Turkey to increase link strength.

4.2.4. Keywords

Keywords used in ISE publication touched on areas that included demographics (male, female, adult, middle-aged, adolescent, young adult), attributes (attitude, religion, cultural, knowledge, practice), and types of study (ethnology, psychology, medical education, anthropology, history, politics, curriculum). However, other prevailing keywords could be summarised in the map shown in Figure 5. The future research could undertake other topics and keywords in order to better understand other aspects of the ISE discourse.
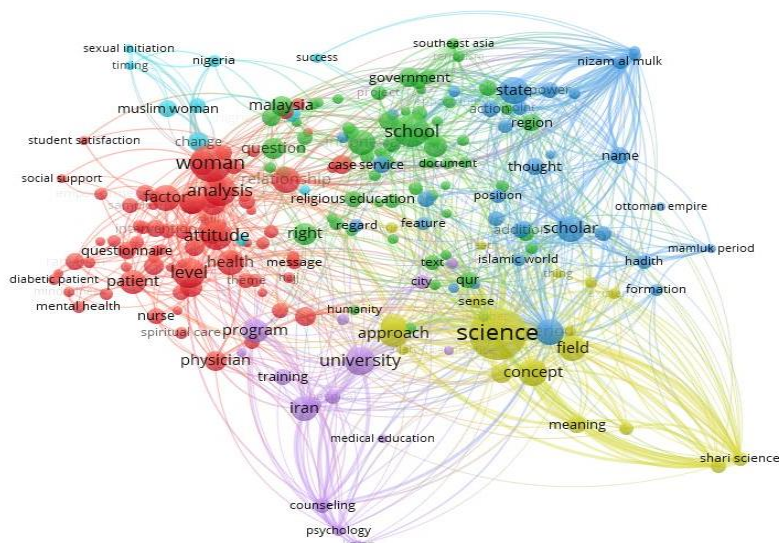

Figure 5. The links formation among the keywords in ISE

5. Discussion

The finding revealed that the number of documents in literature ISE has increased and slightly fluctuated in terms of socio-cultural aspects. However, ISE started to be covered extensively in multiple disciplines, evolving initially from the pure sciences and converging into various other disciplines. The current trend of research in ISE has started to cover interdisciplinary studies and called for inter-affiliation networking. Furthermore, with large scale digitalisation efforts, Islamic manuscripts stored in various institutions and repositories are now easily accessed for research purposes.[48] This has created a greater academic networking and inter-affiliation which are necessary to disseminate the knowledge of Islam and Science in education.

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[48] Amidu Olalekan Sanni, "Islamic Historical Sources: Manuscripts and Online," in *Oxford Research Encyclopedia of African History* (Oxford University Press, 2018). https://doi.org/10.1093/acrefore/9780190277734.013.124.

The bibliographic analysis which refers to the historical timeline can be useful in various fields as it helps researchers to obtain previous related research to identify research gaps in existing studies. In this study, the available documents in the Scopus database do not manifest the real situation in ISE. The data from N-Gram shows the English document in ISE by Kotb [49] in 1951. Aside from the 20 years gap in Scopus as compared to N-Gram, the Scopus database has listed 77 relevant secondary documents related to the search string. The secondary document is a document that has been extracted from a Scopus document reference list but it is not available directly in the Scopus database. These 77 articles were not further analysed outside the corpus of the inclusion criteria of this study.

Even though the Scopus database is recognised as a multidisciplinary database with significant normative power,[50] it was surprising that several important academic figures and experts' names were not included in the database. Prominent scholars who had contributed significantly to ISE discourse such as Fazlur Rahman, Seyyed Hossein Nasr, Isma'il Raji al- Faruqi and Syed Muhammad Naquib al-Attas[51] (to name a few) but they were not in the top list found in the database. This phenomenon leads to an imbalanced view of the actual scholarship on ISE. Discussions and deliberations on ISE have taken place much earlier, but in Scopus, the earliest article indexed was from the 1970s. This means that earlier thoughts and researches on ISE were not Scopus-indexed. Despite the significant unindexed past literature work and secondary data, Scopus provided lesser credit to other types of publications (i.e. books, theses, monographs, and unindexed journal articles) and heavily focused on publication indexed journal articles.[52]

Several studies reported the skewed proportion of the published articles or journal scopes covered by Scopus. The social sciences and humanities are underrepresented[53]in Scopus. According to Archambault and Gagne,[54] the country representation is skewed because of the biasness of the database. Similarly comparative studies also claimed that the

[49]Yusef Salah El-Din Kotb, "Science and Science Education in Egyptian Society," (New York: Columbia University Press, 1951).

[50]Fiorenzo Franceschini, Domenico Maisano, and Luca Mastrogiacomo, "The Museum of Errors/Horrors in Scopus," *Journal of Informetrics*, 10.1 (2016): 174-82. https://doi.org/10.1016/j.joi.2015.11.006.

[51]Asyraf Ab Rahman, et al., "Quranic Literary Study: Sayyid Qutb's Thought and Orientation."

[52]Alberto Martín-Martín, et.al, "Google Scholar, Web of Science, and Scopus: A Systematic Comparison of Citations in 252 Subject Categories," *ArXiv*, 12.4 (2018): 1160-77.

[53]Martín-Martín et. al., Philippe Mongeon and Adèle Paul-Hus, "The Journal Coverage of Bibliometric Databases : A Comparison of Scopus and Web of Science," *Scientometrics* (November, 2014): 1-6. https://doi.org/10.13140/2.1.4759.7762.

[54]Eric Archambault, and Vignola Gagne, "The Use of Bibliometrics in the Social Sciences and Humanities(Science-Metrix Final Report)," *SSHRC-CRSH*, 2004.

Scopus database was favoured by some countries in the North East [55] with an overrepresentation of the English language.[56] The geographical and language preference of Scopus discriminated against the invaluable cultural perspectives and contexts of knowledge generation which in turn, dictated "what we read, what we value, and what we build upon."[57] From the contextual lenses, the discourse of ISE in this manuscript might reflect the digital divide as well. ISE falls in the social sciences and humanities discipline, and contributions are mainly in languages other than English, depending on where the article was written. The nature of the database itself could also cause this issue. The Scopus-indexed journals or publications were not preferred in the eastern hemisphere before 2004, revealing the data bias itself. Possibly, the underrepresentation of ISE topics of concern might lie in the tedious work and budget for language editing to meet the English medium used widely by Scopus-indexed journals as well as the trend of publication fees for the pay-to-publish model.[58] As discussed by Corona,[59] this trend does not favour the non-English speaking developing countries. Thus, in this study, it is found that the focused articles on ISE were not well covered in Scopus which might risk disproportionate understanding of the real ISE discourse. Amid the era of misinformation, accurate evidence-based documents should be easily accessed and widely distributed. Scholars should publish a more critical view on ISE in reputable databases to create a lively discourse based on factual knowledge to overcome misconceptions, discrimination, and bias towards Islam.

6. Conclusion

Overall, it is expected that ISE discourse from 2020 onwards would continue to grow. ISE topic will continue to be debated and researched on, and consequently, more documents will be published. The research and higher learning institutions with the agenda to harmonise Islam and science needs to be active in disseminating the information on ISE

[55]Alberto Martín-Martín, et.al, "Google Scholar, Web of Science, and Scopus: A Systematic Comparison of Citations in 252 Subject Categories."; Philippe Mongeon and Adèle Paul-Hus, "The Journal Coverage of Bibliometric Databases : A Comparison of Scopus and Web of Science."

[56]Alberto Martín-Martín, et.al, "Google Scholar, Web of Science, and Scopus: A Systematic Comparison of Citations in 252 Subject Categories."; Philippe Mongeon and Adèle Paul-Hus, "The Journal Coverage of Bibliometric Databases : A Comparison of Scopus and Web of Science."; Emilio Delgado-López-Cózar and Rafael Repiso-Caballero, "The Impact of Scientific Journals of Communication: Comparing Google Scholar Metrics, Web of Science and Scopus," *Comunicar*, 21.41 (2013): 45-52 . https://doi.org/10.3916/C41-2013-04.

[57]Jon Tennant, "Elsevier Are Corrupting Open Science in Europe," *The Guardian*, 2018.

[58]Janvan Dalen, "In the News! An Opinion - Paying to Publish," *Education for Health*, 26.1 (2013): 66. https://doi.org/10.4103/1357-6283.112806.

[59]Piermaria Corona, ""Pros and Cons of Open Access Journals: Paying to Read or Paying to Publish?," *Annals of Silvicultural Research*, 44.2 (2020): 64-65. https://doi.org/10.12899/asr-1981.

through publication of journal articles as an effort to overcome the gap one of the main finding of this study, which revolves around the discrepancies of the Scopus database.

Scopus provides the basis for the university and global rankings, tenure and promotion guidelines, eases in bibliometric research, and forms critical components of the research ecosystem. However, this study supported by the past studies' claims that Scopus is structurally biased against research produced in the non-Western countries, non-English language research, and research from the arts, humanities and social sciences.[60] ISE might fall into the bias-prone category which include the non-Western countries, use of vernacular languages, and fall under the field of arts, humanities and social sciences. Although this study attempted to understand the ISE literature coverage, the finding reveals systematic inequities in the knowledge production systems. This issue must be noted by other researchers in ISE.

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[60]Tennant, "Elsevier Are Corrupting Open Science in Europe," *The Guardian*, 2018.

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